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Characteristics of the Betatron Radiation from the Direct-Laser Accelerated Electrons[1] TAIWU HUANG, Center for Applied Physics and Technology and School of Physics, Peking University, Beijing 100871, People's Republic of China, ALEX ROBINSON, Central Laser Facility, STFC Rutherford-Appleton Laboratory, Didcot, OX11 0QX, United Kindom, CANGTAO ZHOU, Institute of Applied Physics and Computational Mathematics, Beijing 100094, People's Republic of China, BIN QIAO, Center for Applied Physics and Technology and School of Physics, Peking University, Beijing 100871, People's Republic of China, BIN LIU, Institute of Applied Physics and Computational Mathematics, Beijing 100094, People's Republic of China, XIANTU HE, Center for Applied Physics and Technology and School of Physics, Peking University, Beijing 100871, People's Republic of China, PETER NORREYS, Central Laser Facility, STFC Rutherford-Appleton Laboratory, Didcot, OX11 0QX, United Kindom — The underlying scalings of the direct-laser accelerated electrons and the radiated photons are investigated. The dependence of the radiation properties on the plasma density and laser intensity is given analytically. It is shown that the electron dynamics and the emitted photons are strongly dependent on a self-similar parameter of $n_e/n_c a_0$. This controls the energy gain and the transverse betatron amplitude of the electrons, as well as the radiated photon number and photon energy. In addition, it is shown that the total number of the photons is proportional to a_0^2 and the conversion efficiency of the photons from the accelerated electrons is proportional to a_0^3 for a fixed value of $n_e/n_c a_0$.
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